

The Influence of Information Technology Investment on the Organizational Performance: The Moderating Role of External Environment

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Abstract: In the information era, enterprises can enhance organizational performance through advanced information technology. Based on the resource-based view, this paper examines the mechanism by which information technology (IT) investment influences organizational performance, with the external environment as a moderating variable. Using 265 valid samples collected from agricultural enterprises in Shandong province, this study conducts an empirical test through partial least squares structural equation modeling. The results demonstrate that IT investment has a significant positive effect on organizational performance, and the external environment significantly moderates the relationship between IT investment and organizational performance. This research contributes to a deeper understanding of the relationship between IT investment and organizational performance, enriches resource-based theory, expands the research framework on IT investment, and offers guidance for enterprises seeking sustainable growth.

Keywords: IT investment; Organizational performance; External environment

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1. Introduction

Information represents a new productive force and development trajectory, serving as the driving force behind social innovation, economic development, and strategic transformation. Under the dual strategy of promoting industrialization through information technology and vice versa, a new technological revolution is emerging ^[1]. This has led to a significant increase in information technology (IT) investment by enterprises, making China one of the fastest-growing markets for technology stocks ^[2]. Chinese companies face the challenge of staying ahead of rapid technological changes, necessitating investment in cutting-edge tools ^[3]. Information technology has significantly benefited Chinese enterprises, for example, the application of management information systems has greatly accelerated information processing, improved production flows, and enhanced employee

efficiency. Both internal process improvements and the increased value-added capability for customers are reflected in organizational performance. IT investment has thus become a critical component of organizational performance growth. Simultaneously, the external environment of organizational management in China may significantly impact organizational performance. While market competition is a key element of the external environment, Li found that market competition has a positive moderating effect on the relationship between research and development investment and firm performance ^[4].

Throughout the literature on the relationship between IT and organizational performance, scholars have conducted extensive research. However, there are still limitations: most existing studies focus on theoretical analysis and case studies. Although some literature employs quantitative methods to examine the direct impact of IT on enterprise performance, the complex mechanism through which IT investment affects organizational performance has not been thoroughly explored.

Based on the resource-based view, this study uses agricultural enterprises in Shandong as research samples to investigate the influence of IT investment on organizational performance, and it explores the moderating role of the external environment in the relationship between IT investment and organizational performance.

2. Theoretical framework and hypotheses

2.1. IT investment and organizational performance

According to previous research, investment in technological advancement is one of the main factors influencing organizational performance. The resource-based view (RBV) asserts that it has a positive direct effect on organizational performance. Investing in technology enhances a company's innovation capabilities while reducing costs and increasing operational efficiency ^[5]. Financial performance is a key indicator for evaluating organizational performance, reflecting the organization's profitability and overall health. Based on prior research ^[6], this paper divides IT investment into three dimensions: IT technology architecture, complementary human resources, and complementary relationship resources, leading to the following hypotheses:

H1: IT technology architecture has a significant positive impact on financial performance.

H2: Complementary human resources have a significant positive impact on financial performance.

H3: Complementary relationship resources have a significant positive impact on financial performance.

2.2. Moderating role of the external environment

Previous studies have found that market competition moderates the relationship between technology investment and organizational performance in China ^[4,7]. In light of this, our study proposes the following hypotheses:

H4: Market competition moderates the relationship between IT technology architecture and organizational performance.

H5: Market competition moderates the relationship between complementary human resources and organizational performance.

H6: Market competition moderates the relationship between complementary relationship resources and organizational performance.

2.3. External environment and organizational performance

According to contingency theory, the success of a company's strategy and investment depends on the external environment in which it operates. Organizations must consider factors such as market demand, competitive

environment, legal and policy frameworks, technological changes, and innovation, and respond flexibly to improve performance and maintain a competitive edge. Different external environments will have varying degrees of impact on an organization’s operations and development, thereby influencing its performance. In the context of China, the economic climate, regulatory frameworks, and market competition are key components of the external environment. This study specifically examines the impact of market competition on organizational performance, leading to the following hypothesis:

H7: Market competition has a significant positive impact on financial performance.

Based on the above research hypotheses, the paper proposes a research framework, as illustrated in **Figure 1**.

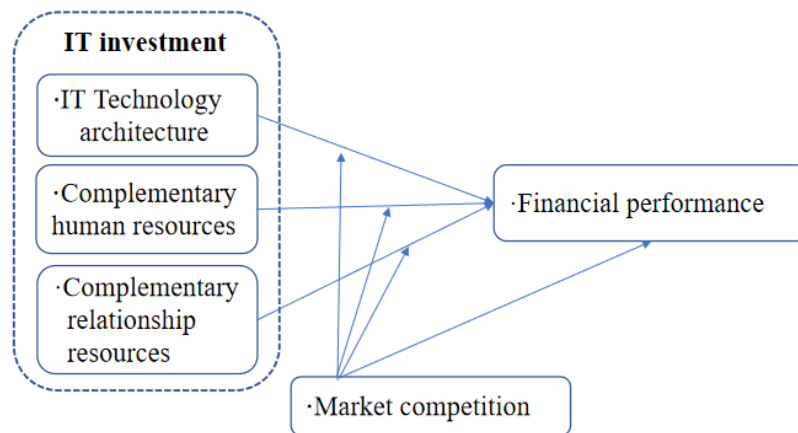


Figure 1. Research framework

3. Research design

3.1. Sample and scale

This paper selects innovative agricultural enterprises in Shandong province as the research subjects. All enterprises are over 5 years old, with more than 200 employees. The sample includes state-owned enterprises, private enterprises, and foreign-funded enterprises, covering all cities in Shandong province, China.

Data collection was conducted through a survey using questionnaires, individual interviews, and in-depth interviews. The survey began on February 20, 2023, and concluded on October 31, 2023. Over the 8 months, 260 questionnaires were collected, of which 218 were valid. Relative to the scale items (20 questions), statistical tests confirmed that the sample size meets the statistical requirements.

3.2. Variable measurement

This study adopts a classical scale, with core variables measured using a 5-point Likert scale. A score of 1 to 5 indicates responses ranging from “Strongly disagree” to “Strongly agree.”

3.3. Common method bias

This paper addresses common method bias through both process control and statistical analysis. In terms of process control, two methods—scrambling items and anonymous responses—were used. For statistical analysis, Harman’s single-factor test was employed to test for common method bias. The results showed that the variance explained by the first factor was 40.2%, lower than the recommended threshold of 50%. Additionally, following

Kock's recommendation, a full collinearity assessment method was used, and the variance inflation factor for all first-order variables was below the 3.3 threshold. Thus, the common method bias in this study is within a controllable range and does not significantly affect the results.

3.4. Reliability and validity tests

3.4.1. Reliability and validity test

The reliability of the scale was first tested using the reliability coefficient method and composite reliability. Details are shown in **Table 1**. The coefficients for all variables exceeded 0.67, indicating good stability. Content validity and construct validity were used to assess the validity of the sample data. For content validity, the scale is accurate and comprehensive as it is based on classical scales. Construct validity was evaluated through convergent validity and discriminant validity. The loading coefficient of each indicator exceeded 0.63, composite reliability was greater than 0.72, and AVE values were all above 0.5, indicating strong convergent validity. Additionally, the square root of AVE for each factor was greater than the absolute value of the correlation coefficient between the factor and other factors, demonstrating good discriminant validity.

Table 1. Reliability and validity analysis

Factor	Measurement index and load factor	α coefficient	C.R.	AVE
IT technology architecture	A1 (0.856), A2 (0.805), A3 (0.905), A4 (0.859)	0.945	0.902	0.754
Complementary human resources	B1 (0.793), B2 (0.765), B3 (0.875), B4 (0.805)	0.853	0.712	0.739
Complementary relationship resources	C1 (0.803), C2 (0.794), C3 (0.882), C4 (0.825)	0.973	0.922	0.812
Market competition	D1 (0.823), D2 (0.815), D3 (0.915), D4 (0.931)	0.819	0.762	0.929
Financial performance	E1 (0.834), E2 (0.747), E3 (0.722), E4 (0.817)	0.806	0.796	0.750

3.4.2. Hypothesis test

This study uses Amos21 to build a structural equation model and examines the chi-square freedom ratios (χ^2/df), CFI, RMSEA, and TLI values. The results were as follows: $\chi^2/df = 2.605 (< 3)$, CFI = 0.910 (> 0.9), RMSEA = 0.068 (< 0.08), TLI = 0.932 (> 0.9), and NFI = 0.91. All indexes are within acceptable ranges, indicating that the model fits the sample data well.

4. Empirical analysis

4.1. Path analysis

The path analysis of all variables showed that complementary human resources had a significant positive effect on financial performance ($T = 1.075, P < 0.01$), with a path coefficient of 0.178, confirming H2. Complementary relationship resources also had a significant positive effect on financial performance ($T = 0.228, P < 0.01$), with a path coefficient of 0.243, validating H3. Furthermore, market competition had a significant positive effect on financial performance ($T = 2.503, P < 0.001$), with a path coefficient of 0.311, confirming H7. However, IT technology architecture did not show a significant positive effect on financial performance.

4.2. Moderating role

To test the moderating role, the usual method is to check whether the interaction of the independent variable (IV)

and moderating variable (MV) significantly affects the regression coefficient of the dependent variable (DV), or whether the change in the regression equation's R^2 is significant before and after the inclusion of the interaction term^[8].

In this paper, the moderating role of the external environment is tested using these methods. For example, market competition's moderating role between complementary human resources and financial performance was significant, with a positive moderating coefficient ($\beta = 0.321$, $P < 0.05$). This indicates that the greater the alignment between complementary human resources and market competition, the stronger the influence of complementary human resources on financial performance, confirming H5. Similarly, market competition had a significant moderating role between complementary relationship resources and financial performance, but not between IT technology architecture and financial performance.

5. Conclusion and insights

5.1. Research conclusion

Firstly, the positive impact of IT investment on organizational performance was confirmed. In terms of complementary human resources, once a company invests capital, it immediately influences decision-making, thus affecting performance. Therefore, complementary human resources positively impact performance. Similarly, complementary relationship resources also positively affect enterprises. However, due to the learning and diffusion process required for IT technology architecture, the impact on performance may not be immediately apparent. In the early stages of IT technology architecture investment, experimentation, and learning are high, with often unsatisfactory returns. Over time, the benefits of investment in technology architecture become more apparent, which is why the short-term impact on performance is not significant.

Secondly, the moderating role of market competition between IT investment and organizational performance was confirmed. The results indicate that market competition moderates the relationship between complementary human resources (and complementary relationship resources) and financial performance. Without considering market competition, even significant investments in IT may yield suboptimal results, making it difficult for organizations to achieve their desired performance levels.

5.2. Managerial insights

First, attention should be paid to the development of information technology, information platforms, and information resources. Agricultural enterprises in Shandong province should develop a clear strategic plan for IT resources, integrating internal and external manpower, capital, and technology to provide a foundation for IT development and utilization. In the new wave of technological transformation, enterprises should seize opportunities for IT upgrades, laying the groundwork for digitalization, intelligence, and informatization to improve performance and expand competitive advantages.

Second, the impact of the external environment must be considered. Enterprises need to enhance their awareness of the external environment, remain sensitive to new opportunities, and use innovative business models to transform themselves and build a competitive business ecosystem.

5.3. Limitations and future prospects

This study has some limitations. First, it uses cross-sectional data, which makes it difficult to reveal the dynamic process of IT-driven performance improvement. Future research could use longitudinal tracking

methods to explore the causal relationships between variables. Second, while measurement tools were based on established scales, they were adjusted to align with Chinese language habits, which may affect reliability and validity. Third, the sample was drawn mainly from innovative agricultural enterprises in Shandong, and the findings may differ across cultural contexts, industries, and organizational scales. Future research could expand the sample and further test the heterogeneity and stability of the conclusions.

Disclosure statement

The authors declare no conflict of interest.

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